

RADIO TEST REPORT

S

5

Report No: STS1812116W02

Issued for

ShenZhen Aomais Technology Co.Ltd.

no.t1 of the grand courtyard of the silicon valley longhua district, shenzhen China

Product Name:	TWS	
Brand Name:	N/A	
Model Name:	T1	
Series Model:	N/A	
FCC ID:	2ANMAT1	
Test Standard:	FCC Part 15.247	

Any reproduction of this document must be done in full. No single part of this document may be reproduced we permission from STS, All Test Data Presented in this report is only applicable to presented Test sample VAL

Shenzhen STS Test Services Co., Ltd. 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China TEL: +86-755 3688 6288 FAX: +86-755 3688 6277 E-mail:sts@stsapp.com





TEST RESULT CERTIFICATION

Applicant'sname:	ShenZhen Aomais Technology Co.Ltd.
Address	no.t1 of the grand courtyard of the silicon valley longhua district, shenzhen China
Manufacture's Name:	Dongguan Jin wen hua digital technology Co., LTD.
Address	NO.1 Hua Da Road, Long Bei Ling Village, TangxiaTown, Dongguan City, Guangdong, China
Product description	
Product Name:	TWS
Brand Name:	N/A
Model Name:	T1
Series Model:	N/A
Test Standards:	FCC Part15.247
Test procedure: /	ANSI C63.10-2013

This device described above has been tested by STS, the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

This report shall not be reproduced except in full, without the written approval of STS, this document may be altered or revised by STS, personal only, and shall be noted in the revision of the document...

Date of Test.....

Date (s) of performance of tests .: 24 Dec. 2018 ~ 26 Dec. 2018

Date of Issue 26 Dec. 2018

Test Result Pass

Testing Engineer

(Chris chen)

Technical Manager

Ju



Authorized Signatory :

(Sunday Hu)

(Vita Li)

Shenzhen STS Test Services Co., Ltd.

 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

 Tel: + 86-755 3688 6288
 Fax: + 86-755 3688 6277

 Http://www.stsapp.com
 E-mail: sts@stsapp.com

Report No.: STS1812116W02



Table of Contents	Page
1. SUMMARY OF TEST RESULTS	6
1.1 TEST FACTORY	7
1.2 MEASUREMENT UNCERTAINTY	7
2. GENERAL INFORMATION	8
2.1 GENERAL DESCRIPTION OF THE EUT	8
2.2 DESCRIPTION OF THE TEST MODES	10
2.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING	10
2.4 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	11
2.5 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS	12
2.6 EQUIPMENTS LIST	13
3. EMC EMISSION TEST	15
3.1 CONDUCTED EMISSION MEASUREMENT	15
3.2 RADIATED EMISSION MEASUREMENT	19
4. CONDUCTED SPURIOUS & BAND EDGE EMISSION	30
4.1 LIMIT	30
4.2 TEST PROCEDURE	30
4.3 TEST SETUP	30
4.4 EUT OPERATION CONDITIONS	30
4.5 TEST RESULTS	31
5. NUMBER OF HOPPING CHANNEL	43
5.1 LIMIT	43
5.2 TEST PROCEDURE	43
5.3 TEST SETUP	43
5.4 EUT OPERATION CONDITIONS	43
5.5 TEST RESULTS	44
6. AVERAGE TIME OF OCCUPANCY	45
6.1 LIMIT	45
6.2 TEST PROCEDURE	45
6.3 TEST SETUP	45
6.4 EUT OPERATION CONDITIONS	45
6.5 TEST RESULTS	46
7. HOPPING CHANNEL SEPARATION MEASUREMEN	52
7.1 LIMIT	52

Page 3 of 69

Ħ

Report No.: STS1812116W02



Table of Contents	Page
7.2 TEST PROCEDURE	52
7.3 TEST SETUP	52
7.4 EUT OPERATION CONDITIONS	52
7.5 TEST RESULTS	53
8. BANDWIDTH TEST	59
8.1 LIMIT	59
8.2 TEST PROCEDURE	59
8.3 TEST SETUP	59
8.4 EUT OPERATION CONDITIONS	59
8.5 TEST RESULTS	60
9. OUTPUT POWER TEST	66
9.1 LIMIT	66
9.2 TEST PROCEDURE	66
9.3 TEST SETUP	66
9.4 EUT OPERATION CONDITIONS	66
9.5 TEST RESULTS	67
10. ANTENNA REQUIREMENT	68
10.1 STANDARD REQUIREMENT	68
10.2 EUT ANTENNA	68

Page 4 of 69

Ħ



Page 5 of 69 Report No.: STS1812116W02

Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	26 Dec. 2018	STS1812116W02	ALL	Initial Issue



Shenzhen STS Test Services Co., Ltd.

1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China Tel: + 86-755 3688 6288 Fax:+ 86-755 3688 6277 Http://www.stsapp.com E-mail: sts@stsapp.com



1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards: DA 00-705

FCC Part 15.247,Subpart C				
Standard Section	Test Item	Judgment	Remark	
15.207	Conducted Emission	PASS		
15.247(a)(1)	Hopping Channel Separation	PASS		
15.247(a)(1)&(b)(1)	Output Power	PASS		
15.247(c)	Radiated Spurious Emission	PASS		
15.247(d)	Conducted Spurious & Band Edge Emission	PASS		
15.247(a)(iii)	Number of Hopping Frequency	PASS		
15.247(a)(iii)	Dwell Time	PASS		
15.247(a)(1)	Bandwidth	PASS		
15.205	Restricted Band Edge Emission	PASS		
Part 15.247(d)/part 15.209(a)	Band Edge Emission	PASS		
15.203	Antenna Requirement	PASS		

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

(2) All tests are according to ANSI C63.10-2013



1.1 TEST FACTORY

Shenzhen STS Test Services Co., Ltd. Add. : 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China FCC Registration No.: 625569 IC Registration No.: 12108A; A2LA Certificate No.: 4338.01;

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of **k=2**, providing a level of confidence of approximately **95** %.

No.	Item	Uncertainty
1	RF output power, conducted	±0.71dB
2	Unwanted Emissions, conducted	±0.63dB
3	All emissions, radiated 30-200MHz	±3.43dB
4	All emissions, radiated 200MHz-1GHz	±3.57dB
5	All emissions, radiated>1G	±4.13dB
6	Conducted Emission(9KHz-150KHz)	±3.18dB
7	Conducted Emission(150KHz-30MHz)	±2.70dB

Shenzhen STS Test Services Co., Ltd.



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

Product Name	TWS
Trade Name	N/A
Model Name	T1
Series Model	N/A
Model Difference	N/A
Channel List	Please refer to the Note 2.
Bluetooth	Frequency:2402 – 2480 MHz Modulation: GFSK(1Mbps), π/4-DQPSK(2Mbps), 8DPSK(3Mbps)
Buletooth Version	5.0 BR+EDR
Battery	Capacity: 60 mAh Rated Voltage: DC3.7V Charge Limit: DC 4.25V
Hardware version number	V1.5
Software version number	2.1.3
Connecting I/O Port(s)	Please refer to the User's Manual

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2. Left and right headset all has been tested, they has same RF parameter.





3.

		Chanr	nel List		
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

4. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	N/A	T1	PIFA	N/A	0 dBi	BT Antenna



2.2 DESCRIPTION OF THE TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Worst Mode	Description	Data Rate/Modulation	
Mode 1	TX CH00	1Mbps/GFSK	
Mode 2	TX CH39	1Mbps/GFSK	
Mode 3	TX CH78	1Mbps/GFSK	
Mode 4	TX CH00	2 Mbps/π/4-DQPSK	
Mode 5	TX CH39	2 Mbps/π/4-DQPSK	
Mode 6	TX CH78	2 Mbps/π/4-DQPSK	
Mode7	TX CH00	3 Mbps/8DPSK	
Mode 8	TX CH39	3 Mbps/8DPSK	
Mode 9	TX CH78	3 Mbps/8DPSK	
Nata.			

Note:

(1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported

(2) We have be tested for all avaiable U.S. voltage and frequencies(For 120V,50/60Hz

and 240V, 50/60Hz) for which the device is capable of operation, and the worst case of 120V/ 60Hz is shown in the report

For AC Conducted Emission

	Test Case
AC Conducted	Mode 10 : Keeping BT TX
Emission	

2.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of FHSS.

Test software Version	Test program: Bluetooth					
Frequency	2402 MHz 2441 MHz 2480 MHz					
(Power control software) Parameters(1/2/3Mbps)	Power class: 1 M rate:4:27 2 M rate:11:183 3 M rate:15:339	Power class: 1 M rate:4:27 2 M rate:11:183 3 M rate:15:339	Power class: 1 M rate:4:27 2 M rate:11:183 3 M rate:15:339			

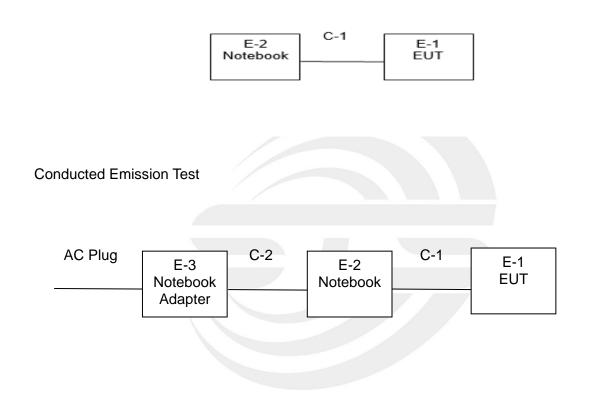


 Page 11 of 69
 Report No.: STS1812116W02

2.4 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of FHSS

Radiated Spurious Emission Test



Shenzhen STS Test Services Co., Ltd.



2.5 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

	Necessary accessories									
Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note					
N/A	N/A	N/A	N/A	N/A	N/A					

Support units

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
E-2	Notebook	HP	500-320cx	N/A	N/A
E-3	Notebook Adapet	HP	HSTNN-CA15	N/A	N/A
C-1	USB Cable	N/A	100cm	N/A	N/A
C-2	DC Cable	N/A	110cm	N/A	N/A

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in ^CLength² column.
- (3) "YES" is means "shielded" "with core"; "NO" is means "unshielded" "without core".



2.6 EQUIPMENTS LIST

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2018.10.13	2019.10.12
Bilog Antenna	TESEQ	CBL6111D	34678	2017.11.02	2020.11.01
Horn Antenna	Schwarzbeck	BBHA 9120D(1201)	9120D-1343	2017.10.27	2020.10.26
SHF-EHF Horn Antenna (18G-40GHz)	A-INFO	LB-180400-KF	N/A	2018.03.11	2021.03.10
Temperature & Humitidy	HH660	Mieo	N/A	2018.10.13	2019.10.12
Pre-mplifier (0.1M-3GHz)	EM	EM330	N/A	2018.03.09	2019.03.08
PreAmplifier (1G-18GHz)	SKET	LNPA-01018G-45	SK201808090 1	2018.10.13	2019.10.12
Passive Loop (9K30MHz)	ZHINAN	ZN30900C	16035	2017.03.11	2020.03.10
Low frequency cable	EM	R01	N/A	2018.03.11	2019.03.10
Low frequency cable	EM	R06	N/A	2018.03.11	2019.03.10
High frequency cable	SCHWARZBECK	R04	N/A	2018.03.11	2019.03.10
High frequency cable	SCHWARZBECK	R02	N/A	2018.03.11	2019.03.10
Semi-anechoic chamber	Changling	966	N/A	2018.10.24	2020.10.23
turn table	EM	SC100_1	60531	N/A	N/A
Antenna mast	EM	SC100	N/A	N/A	N/A
Max-full Antenna Corp	MF	MFA-440H	N/A	N/A	N/A

Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2018.10.13	2019.10.12
LISN	R&S	ENV216	101242	2018.10.13	2019.10.12
conduction Cable	EM	C01	N/A	2018.03.11	2019.03.10
Temperature & Humitidy	Mieo	HH660	N/A	2018.10.13	2019.10.12



Page 14 of 69 Report No.: STS1812116W02

RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
USB RF power sensor	DARE	RPR3006W	15100041SNO03	2018.10.13	2019.10.12
MXA Signal analyzer	Agilent	N9020A	MY51110105	2018.03.08	2019.03.07
MXA Signal analyzer	Agilent	N9020A	MY49100060	2018.10.13	2019.10.12



Shenzhen STS Test Services Co., Ltd.

1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China Tel: + 86-755 3688 6288 Fax:+ 86-755 3688 6277 Http://www.stsapp.com E-mail: sts@stsapp.com



3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

Operating frequency band. In case the emission fall within the restricted band specified on Part 207(a) limit in the table below has to be followed.

FREQUENCY (MHz)	Conducted Emissionlimit (dBuV)		
	Quasi-peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	
0.50 -5.0	56.00	46.00	
5.0 -30.0	60.00	50.00	

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

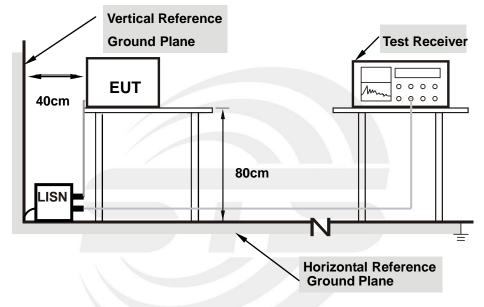
The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz



3.1.2 TEST PROCEDURE

- a. The EUT was 0.8 meters from the horizontal ground plane and 0.4 meters from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.



3.1.3 TEST SETUP

Note: 1.Support units were connected to second LISN. 2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.1.4 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.



3.1.5 TEST RESULT

Temperature:	26 ℃	Relative Humidity:	61%
Test Voltage:	AC 120V/60Hz	Phase:	L
Test Mode:	Mode 10		

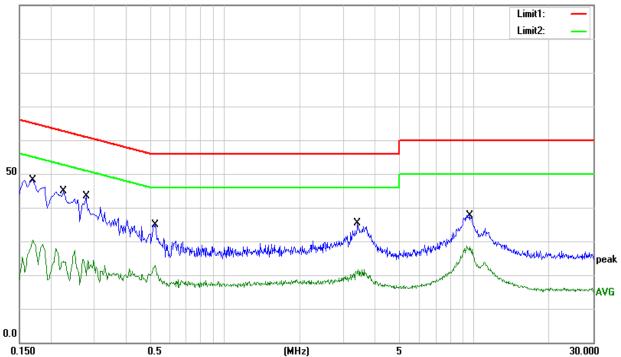
Frequency	Reading	Correct	Result	Limit	Margin	Demeril
(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	Remark
0.1700	27.98	20.23	48.21	64.96	-16.75	QP
0.1700	10.07	20.23	30.30	54.96	-24.66	AVG
0.2260	24.42	20.36	44.78	62.60	-17.82	QP
0.2260	6.97	20.36	27.33	52.60	-25.27	AVG
0.2780	22.65	20.61	43.26	60.88	-17.62	QP
0.2780	3.75	20.61	24.36	50.88	-26.52	AVG
0.5260	14.43	20.45	34.88	56.00	-21.12	QP
0.5260	2.48	20.45	22.93	46.00	-23.07	AVG
3.4060	15.48	19.97	35.45	56.00	-20.55	QP
3.4060	1.57	19.97	21.54	46.00	-24.46	AVG
9.5860	17.63	20.11	37.74	60.00	-22.26	QP
9.5860	8.53	20.11	28.64	50.00	-21.36	AVG

Remark:

1. All readings are Quasi-Peak and Average values.

2. Margin = Result (Result = Reading + Factor)-Limit

100.0 dBuV



1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China Tel: + 86-755 3688 6288 Fax:+ 86-755 3688 6277 Http://www.stsapp.com E-mail: sts@stsapp.com



Page 18 of 69 Report No.: STS1812116W02

Temperature:	26 ℃	Relative Humidity:	61%
Test Voltage:	AC 120V/60Hz	Phase:	N
Test Mode:	Mode 10		

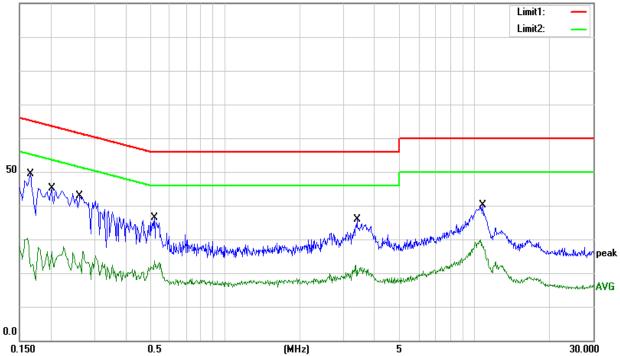
Frequency	Reading	Correct	Result	Limit	Margin	Domork
(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	Remark
0.1660	29.19	20.23	49.42	65.16	-15.74	QP
0.1660	7.32	20.23	27.55	55.16	-27.61	AVG
0.2020	24.83	20.34	45.17	63.53	-18.36	QP
0.2020	7.44	20.34	27.78	53.53	-25.75	AVG
0.2620	22.18	20.60	42.78	61.37	-18.59	QP
0.2620	5.88	20.60	26.48	51.37	-24.89	AVG
0.5220	15.98	20.42	36.40	56.00	-19.60	QP
0.5220	3.28	20.42	23.70	46.00	-22.30	AVG
3.3940	15.87	20.07	35.94	56.00	-20.06	QP
3.3940	1.53	20.07	21.60	46.00	-24.40	AVG
10.8420	20.21	19.85	40.06	60.00	-19.94	QP
10.8420	10.11	19.85	29.96	50.00	-20.04	AVG

Remark:

1. All readings are Quasi-Peak and Average values.

2. Margin = Result (Result = Reading + Factor)-Limit

100.0 dBu¥



1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China Tel: + 86-755 3688 6288 Fax:+ 86-755 3688 6277 Http://www.stsapp.com E-mail: sts@stsapp.com



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS

in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the Restricted band specified on Part15.205(a)&209(a) limit in the table and according to ANSI C63.10-2013 below has to be followed

LIMITS OF RADIATED EMISSION MEASUREMENT (0.009MHz - 1000MHz)

Frequencies	Field Strength	Measurement Distance
(MHz)	(micorvolts/meter) (meters)	
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (1GHz-25 GHz)

FREQUENCY (MHz)	(dBuV/m) (at 3M)		
	PEAK	AVERAGE	
Above 1000	74	54	

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

For Radiated Emission

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/AV
Start Frequency	1000 MHz(Peak/AV)
Stop Frequency	10th carrier hamonic(Peak/AV)
RB / VB (emission in restricted	
band)	PK=1MHz / 1MHz, AV=1 MHz /10 Hz

For Band edge

5	
Spectrum Parameter	Setting
Detector	Peak/AV
Stort/Ston Exercisency	Lower Band Edge: 2300 to 2403 MHz
Start/Stop Frequency	Upper Band Edge: 2479 to 2500 MHz
RB / VB (emission in restricted band)	PK=1MHz / 1MHz, AV=1 MHz / 10 Hz

Shenzhen STS Test Services Co., Ltd.

 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

 Tel: + 86-755
 3688
 6277
 Http://www.stsapp.com
 E-mail: sts@stsapp.com



Page 20 of 69 Report No.: STS1812116W02

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	90kHz~110kHz / RB 200Hz for QP
Start ~ Stop Frequency	110kHz~490kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	490kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

- a. The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz,and above 1GHz.
- b. The EUT was placed on the top of a rotating table 0.8 meters(above 1GHz is 1.5 m) above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment shall be 0.8 m(above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then QuasiPeak detector mode re-measured.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos. Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

3.2.3 DEVIATION FROM TEST STANDARD

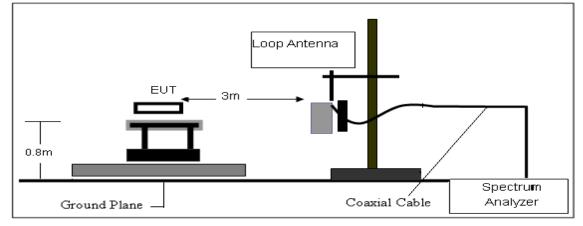
No deviation

Page 21 of 69 Report No.: STS1812116W02

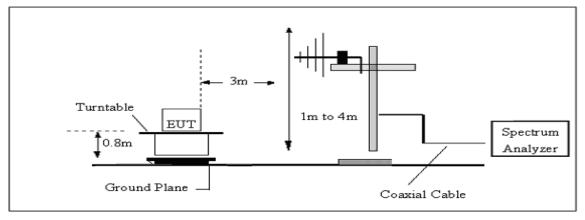


3.2.4 TESTSETUP

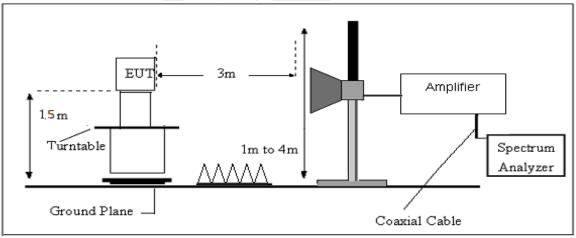
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

Shenzhen STS Test Services Co., Ltd.

 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

 Tel: + 86-755
 3688
 6288
 Fax:+ 86-755
 3688
 6277
 Http://www.stsapp.com
 E-mail: sts@stsapp.com



3.2.6 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG Where FS = Field Strength CL = Cable Attenuation Factor (Cable Loss) RA = Reading Amplitude AG = Amplifier Gain AF = Antenna Factor

For example

Frequency	FS	RA	AF	CL	AG	Factor
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(dB)	(dB)	(dB)
300	40	58.1	12.2	1.6	31.9	-18.1

Factor=AF+CL-AG



Shenzhen STS Test Services Co., Ltd.

1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China Tel: +86-755 3688 6288 Fax:+86-755 3688 6277 Http://www.stsapp.com E-mail: sts@stsapp.com



3.2.7 TEST RESULTS

(9KHz-30MHz)

Temperature:	24.4°C	Relative Humidity:	56%
Test Voltage:	DC 3.7V	Test Mode:	TX Mode

Freq.	Reading	Limit	Margin	State	Toot Docult
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F	Test Result
					PASS
					PASS

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =40 log (specific distance/test distance)(dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.





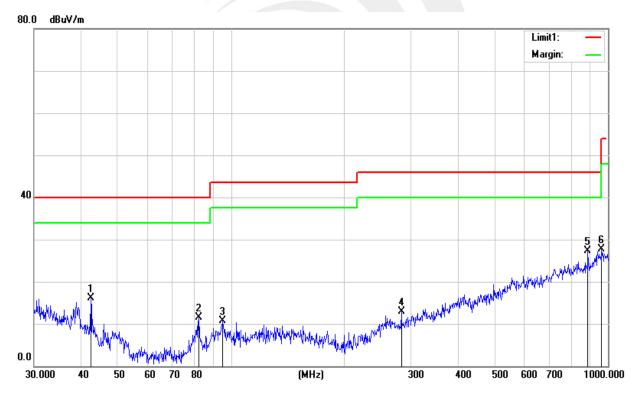
(30MHz-1000MHz)

Temperature:	24.4°C	Relative Humidity:	56%	
Test Voltage:	DC 3.7V	Phase:	Horizontal	
Test Mode:	Mode 1/2/3/4/5/6/7/8/9(Mode 8 worst mode)			

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	42.4508	33.69	-17.59	16.10	40.00	-23.90	QP
2	82.0706	33.63	-22.17	11.46	40.00	-28.54	QP
3	95.0930	30.48	-19.68	10.80	43.50	-32.70	QP
4	282.9852	28.59	-15.69	12.90	46.00	-33.10	QP
5	884.5030	29.77	-2.46	27.31	46.00	-18.69	QP
6	962.1623	27.73	-0.12	27.61	54.00	-26.39	QP

Remark:

1. Margin = Result (Result = Reading + Factor)-Limit



Shenzhen STS Test Services Co., Ltd.

 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

 Tel: + 86-755
 3688
 6277
 Http://www.stsapp.com
 E-mail: sts@stsapp.com



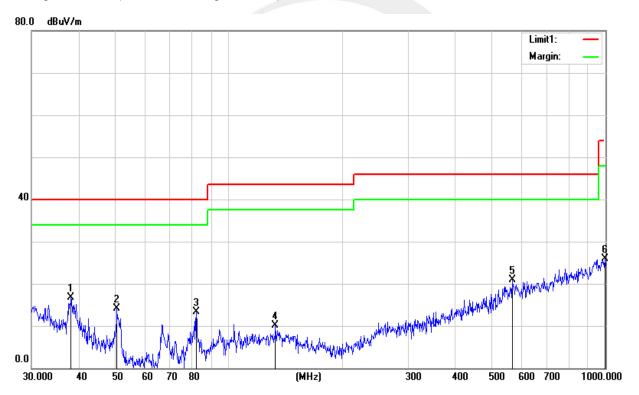
Page 25 of 69 Report No.: STS1812116W02

Temperature:	24.4°C	Relative Humidity:	56%		
Test Voltage:	DC 3.7V	Phase:	Vertical		
Test Mode:	Mode 1/2/3/4/5/6/7/8/9(Mode	de 1/2/3/4/5/6/7/8/9(Mode 8 worst mode)			

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	38.2120	32.07	-15.40	16.67	40.00	-23.33	QP
2	50.5860	35.67	-21.65	14.02	40.00	-25.98	QP
3	82.0706	35.46	-22.17	13.29	40.00	-26.71	QP
4	133.1511	27.74	-17.54	10.20	43.50	-33.30	QP
5	566.6223	27.58	-6.61	20.97	46.00	-25.03	QP
6	996.4996	26.05	-0.09	25.96	54.00	-28.04	QP

Remark:

1. Margin = Result (Result = Reading + Factor)-Limit



Shenzhen STS Test Services Co., Ltd.

Page 26 of 69

Report No.: STS1812116W02



(1GHz~25GHz) Restricted band and Spurious emission Requirements

					8DPSk	K				
Frequency	Meter Reading	Amplifier	Loss	Antenna Factor	Orrected Factor	Emission Level	Limits	Margin	Detector	Comment
(MHz)	(dBµV)	(dB)	(dB)	(dB/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре	
				Low C	hannel (2402	2 MHz)				
3264.66	61.91	44.70	6.70	28.20	-9.80	52.11	74.00	-21.89	PK	Vertical
3264.66	50.70	44.70	6.70	28.20	-9.80	40.90	54.00	-13.10	AV	Vertical
3264.74	62.06	44.70	6.70	28.20	-9.80	52.26	74.00	-21.74	PK	Horizontal
3264.74	51.08	44.70	6.70	28.20	-9.80	41.28	54.00	-12.72	AV	Horizontal
4804.54	58.56	44.20	9.04	31.60	-3.56	55.00	74.00	-19.00	PK	Vertical
4804.54	49.53	44.20	9.04	31.60	-3.56	45.97	54.00	-8.03	AV	Vertical
4804.31	59.41	44.20	9.04	31.60	-3.56	55.85	74.00	-18.15	PK	Horizontal
4804.31	49.25	44.20	9.04	31.60	-3.56	45.69	54.00	-8.31	AV	Horizontal
5359.81	49.19	44.20	9.86	32.00	-2.34	46.85	74.00	-27.15	PK	Vertical
5359.81	39.09	44.20	9.86	32.00	-2.34	36.75	54.00	-17.25	AV	Vertical
5359.68	47.21	44.20	9.86	32.00	-2.34	44.87	74.00	-29.13	PK	Horizontal
5359.68	38.07	44.20	9.86	32.00	-2.34	35.73	54.00	-18.27	AV	Horizontal
7205.77	53.84	43.50	11.40	35.50	3.40	57.24	74.00	-16.76	PK	Vertical
7205.77	43.89	43.50	11.40	35.50	3.40	47.29	54.00	-6.71	AV	Vertical
7205.95	54.36	43.50	11.40	35.50	3.40	57.76	74.00	-16.24	PK	Horizontal
7205.95	43.71	43.50	11.40	35.50	3.40	47.11	54.00	-6.89	AV	Horizontal
				Middle	Channel (244	1 MHz)				
3264.85	61.29	44.70	6.70	28.20	-9.80	51.49	74.00	-22.51	PK	Vertical
3264.85	51.36	44.70	6.70	28.20	-9.80	41.56	54.00	-12.44	AV	Vertical
3264.58	60.93	44.70	6.70	28.20	-9.80	51.13	74.00	-22.87	PK	Horizontal
3264.58	51.05	44.70	6.70	28.20	-9.80	41.25	54.00	-12.75	AV	Horizontal
4882.38	58.86	44.20	9.04	31.60	-3.56	55.30	74.00	-18.70	PK	Vertical
4882.38	50.23	44.20	9.04	31.60	-3.56	46.67	54.00	-7.33	AV	Vertical
4882.36	58.47	44.20	9.04	31.60	-3.56	54.91	74.00	-19.09	PK	Horizontal
4882.36	50.06	44.20	9.04	31.60	-3.56	46.50	54.00	-7.50	AV	Horizontal
5359.70	48.89	44.20	9.86	32.00	-2.34	46.55	74.00	-27.45	PK	Vertical
5359.70	39.78	44.20	9.86	32.00	-2.34	37.44	54.00	-16.56	AV	Vertical
5359.84	47.72	44.20	9.86	32.00	-2.34	45.38	74.00	-28.62	PK	Horizontal
5359.84	38.19	44.20	9.86	32.00	-2.34	35.85	54.00	-18.15	AV	Horizontal
7323.79	54.12	43.50	11.40	35.50	3.40	57.52	74.00	-16.48	PK	Vertical
7323.79	43.92	43.50	11.40	35.50	3.40	47.32	54.00	-6.68	AV	Vertical
7323.90	54.12	43.50	11.40	35.50	3.40	57.52	74.00	-16.48	PK	Horizontal
7323.90	43.73	43.50	11.40	35.50	3.40	47.13	54.00	-6.87	AV	Horizontal

Shenzhen STS Test Services Co., Ltd.

 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

 Tel: + 86-755 3688 6288
 Fax:+ 86-755 3688 6277
 Http://www.stsapp.com
 E-mail: sts@stsapp.com



Page 27 of 69 Report No.: STS1812116W02

				High C	hannel (248	0 MHz)				
3264.70	60.84	44.70	6.70	28.20	-9.80	51.04	74.00	-22.96	PK	Vertical
3264.70	51.70	44.70	6.70	28.20	-9.80	41.90	54.00	-12.10	AV	Vertical
3264.67	61.18	44.70	6.70	28.20	-9.80	51.38	74.00	-22.62	PK	Horizontal
3264.67	50.02	44.70	6.70	28.20	-9.80	40.22	54.00	-13.78	AV	Horizontal
4960.56	58.86	44.20	9.04	31.60	-3.56	55.30	74.00	-18.70	PK	Vertical
4960.56	50.14	44.20	9.04	31.60	-3.56	46.58	54.00	-7.42	AV	Vertical
4960.43	58.54	44.20	9.04	31.60	-3.56	54.98	74.00	-19.02	PK	Horizontal
4960.43	49.14	44.20	9.04	31.60	-3.56	45.58	54.00	-8.42	AV	Horizontal
5359.80	48.65	44.20	9.86	32.00	-2.34	46.31	74.00	-27.69	PK	Vertical
5359.80	39.99	44.20	9.86	32.00	-2.34	37.65	54.00	-16.35	AV	Vertical
5359.81	47.37	44.20	9.86	32.00	-2.34	45.03	74.00	-28.97	PK	Horizontal
5359.81	38.56	44.20	9.86	32.00	-2.34	36.22	54.00	-17.78	AV	Horizontal
7439.93	54.13	43.50	11.40	35.50	3.40	57.53	74.00	-16.47	PK	Vertical
7439.93	44.02	43.50	11.40	35.50	3.40	47.42	54.00	-6.58	AV	Vertical
7439.85	54.24	43.50	11.40	35.50	3.40	57.64	74.00	-16.36	PK	Horizontal
7439.85	44.19	43.50	11.40	35.50	3.40	47.59	54.00	-6.41	AV	Horizontal

Note:

1) Scan with GFSK, $\pi/4$ -DQPSK, 8DPSK, the worst case is 8DPSK Mode

2) Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Emission Level = Reading + Factor

The frequency emission of peak points that did not show above the forms are at least 20dB below the limit, the frequency

emission is mainly from the environment noise.

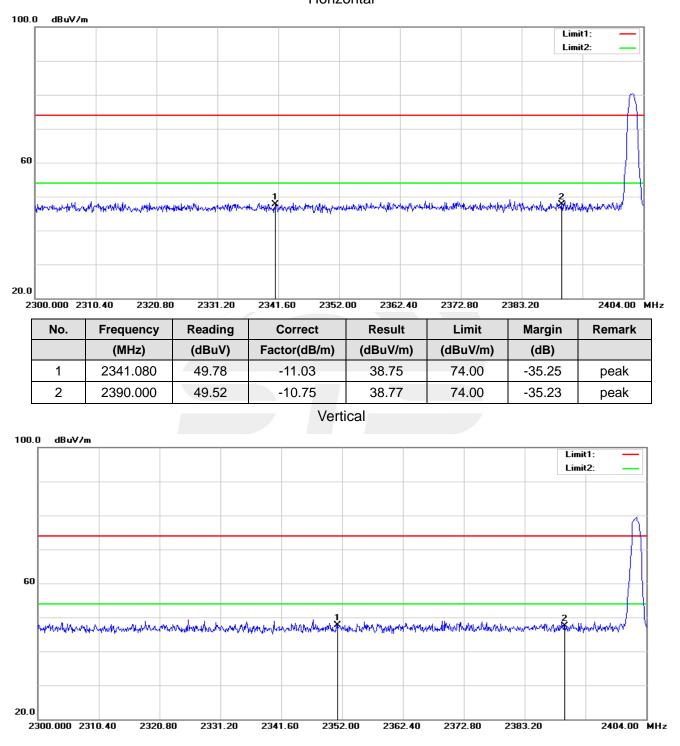
Shenzhen STS Test Services Co., Ltd.



Report No.: STS1812116W02

Band edge Requirements

8DPSK-Low Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2351.272	49.95	-11.25	38.70	74.00	-35.30	peak
2	2390.000	49.62	-11.02	38.60	74.00	-35.40	peak

Shenzhen STS Test Services Co., Ltd.

 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

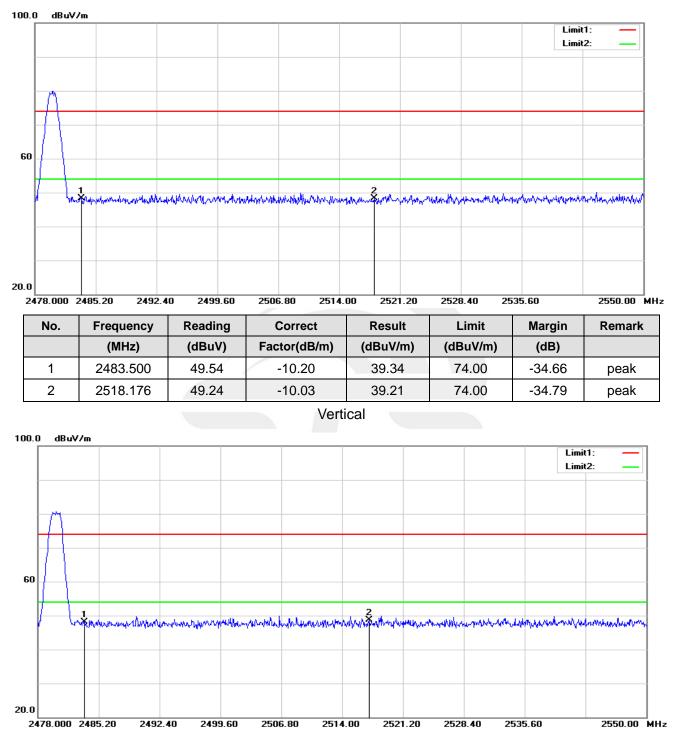
 Tel: + 86-755 3688 6288
 Fax:+ 86-755 3688 6277
 Http://www.stsapp.com
 E-mail: sts@stsapp.com



Page 29 of 69

Report No.: STS1812116W02

8DPSK-High Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	49.66	-10.50	39.16	74.00	-34.84	peak
2	2517.240	49.96	-10.34	39.62	74.00	-34.38	peak

Note: GFSK, π /4-DQPSK,8DPSK of the nohopping and hopping mode all have been test, the worst case is 8DPSK of the nohopping mode, this report only show the worst case.

Shenzhen STS Test Services Co., Ltd.

 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

 Tel: + 86-755
 3688
 6288
 Fax:+ 86-755
 3688
 6277
 Http://www.stsapp.com
 E-mail: sts@stsapp.com



4. CONDUCTED SPURIOUS & BAND EDGE EMISSION

4.1 LIMIT

According to FCC section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

4.2 TEST PROCEDURE

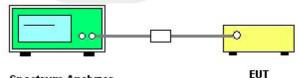
Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	30 MHz to 10th carrier harmonic
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

For Band edge

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Eroguapau	Lower Band Edge: 2300– 2403 MHz
Start/Stop Frequency	Upper Band Edge: 2479 – 2500 MHz
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

Remark : Hopping on and Hopping off mode all have been tested, only worst case hopping off is reported.

4.3 TEST SETUP



Spectrum Analyzer

The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading. Make the measurement with the spectrum analyzer's resolution bandwidth(RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

4.4 EUT OPERATION CONDITIONS

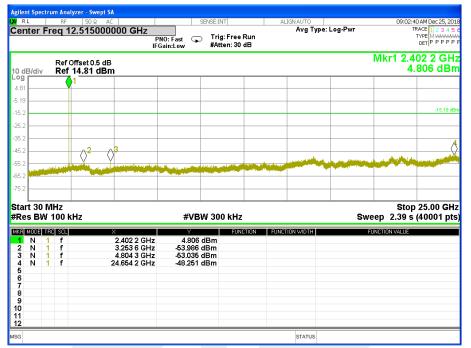
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



4.5 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	50%
Test Mode:	GFSK(1Mbps)-00/39/78 CH	Test Voltage:	DC 3.7V

00 CH



39 CH

RL	RF	50 Ω A	5A		SENSE:INT	A	IGN AUTO		09:11:3	5 AM Dec 25, 21
enter	Freq 1	2.515000	0000 GHz	NO: Fast Gain:Low	- · -		Avg Type:	Log-Pwr	TF	ACE 1 2 3 4 TYPE M WAAWA DET P P P P
) dB/div		Offset 0.5 dE							Mkr1 2.4 4.	40 9 GH 455 dB
46		1								
54										-15.55
i.5										-10.00
.5										
.5		<u>2</u>	A <mark>3</mark>							(
.5	المراد المحملات		Y	a di la colo da la colo			and the second secon			
.5										
.5										
art 30 les BV	MHz N 100 I	kHz		#VB	W 300 kHz	<u>!</u>		Swe	Stop eep 2.39 s	25.00 G (40001 p
	TRC SCL		×	Y		ICTION FUNC	TION WIDTH	F	UNCTION VALUE	
N N	1 f 1 f 1 f 1 f		2.440 9 GHz 3.168 1 GHz 4.881 7 GHz 24.473 8 GHz	4.455 -55.337 -54.747 -48.257	dBm dBm					
N N	1 1									
N	1 T									
3 N										



78 CH

		RF	<mark>zer - Swept S</mark> 50 Ω Ai			SENSE:INT	AL	IGN AUTO			2 AM Dec 25, 2
ente	er Fre	eq 12	2.515000		PNO: Fast 🕞 Gain:Low	⊃ Trig: Free #Atten: 30		Avg Type:	Log-Pwr		TYPE MWWW DET P P P P
dB/d			ffset 0.5 dE I5.39 dBr							Mkr1 2.4 5.	80 2 GI 391 dB
39		- 🔶	1								
61 —											-14.61
1.6											-14.61
.6											
.6 —			2	3							
1.6	انىلى خى		Y		Balling at a second second			and the second se		and the second second	
1.6			and the second second		half a second and						
	30 MI BW 1	Hz 00 kl	Ηz		#VB	W 300 kHz	!		Swe	Stop ep 2.39 s	25.00 G (40001 p
	DE TRC			×	Y		ICTION FUNCT	TION WIDTH	F	JNCTION VALUE	
		f		2.480 2 GHz 3.165 6 GHz	5.391 -55.099	dBm					
N 2 N	1	f									
1 N 2 N 3 N	1	f		4.960 3 GHz	-53.061						
2 N 3 N 4 N	1										
1 N 2 N 3 N 4 N 5	1	f		4.960 3 GHz	-53.061						
1 N 2 N 3 N 4 N 5 7 8	1	f		4.960 3 GHz	-53.061						
N 2 N 3 N 4 N 5 7 8	1	f		4.960 3 GHz	-53.061						
1 N 2 N 3 N 4 N 5 5 7	1	f		4.960 3 GHz	-53.061						
	1	f		4.960 3 GHz	-53.061			STATUS			



П

Shenzhen STS Test Services Co., Ltd.

 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

 Tel: + 86-755 3688 6288
 Fax:+ 86-755 3688 6277
 Http://www.stsapp.com
 E-mail: sts@stsapp.com

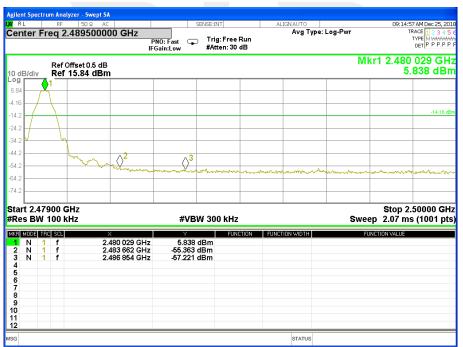


For Band edge

00 CH

	um Analyzer - S										
enter Fi	RF ∣50 req 2.351	ο Ω ΑC 500000		PNO: Fast IFGain:Low		∷Free Run en: 30 dB	AL	IGN AUTO Avg Type:	-	TI	4 AM Dec 25, 20 RACE 1 2 3 4 5 TYPE M WWWA DET P P P P P
0 dB/div	Ref Offset Ref 14.99								N	1kr1 2.401 4.	970 GH 985 dBr
4.99											(
5.0											-15.01 d
5.0											
5.0											\bigcirc
5.0	Johnmonsterle	musunna	mberminister	na wanto mi	any salation	monten		Landerland and a	4 Carlon Marriada	muluinen and	- Martine
5.0											
	000 GHz 100 kHz			#	VBW 30) kHz			Sw	Stop 2. eep 9.87 ms	40300 GI ; (1001 p1
MODE TF 1 N 1 2 N 1 3 N 1 4 5 5 6 7 7	f f	2.39	01 970 GH: 90 022 GH: 99 704 GH:	z -59.2	985 dBm 28 dBm 29 dBm	FUNCTION	FUNCT	ION WIDTH		FUNCTION VALUE	
}) 											
2								STATUS			

78 CH





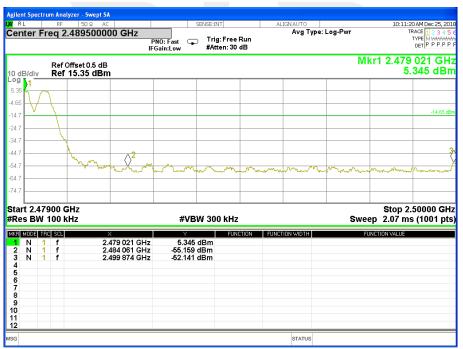


For Hopping Band edge

00 CH

RL	RF	50 Ω AC				SENSE:INT		ALI	GNAUTO		10:08;	:58 AM Dec 25, 3
	req 2.3			PNO: Fa IFGain:Lo	st 🖵	Tui u Cu			Avg Type:	Log-Pwr		TRACE 1 2 3 4 TYPE MWWW DET P P P F
IB/div		set 0.5 dB 5.33 dBm								N	1kr1 2.402 5	2 897 G 6.334 dE
												_
/												
-				_								-14.67
-				_								
′ 												/
,												?
wornd	an a	have been and the second	meneroland	al Alanda	lonalin	M. Burghann	man	ware a	www.www.	MMMM	wwww	man
1												
· ——												
	0000 CH	7									Stop 2	40300 6
rt 2.3	0000 GH / 100 kHz				#VB	W 300 kH	lz			Swe	Stop 2 eep 9.87 m	
rt 2.3(es BW	/ 100 kHz RC SCL	z	× 402.997.CH		Y	F	IZ JNCTION	FUNCT	ON WIDTH			
rt 2.30 es BW N N N	/ 100 kHz 170 sc 1 f 1 f	z 2. 2.	.402 897 GH .390 022 GH	z 4	¥ 5.334 56.774	dBm dBm		FUNCT	ON WIDTH		eep 9.87 m	
rt 2.30 es BW MODE 1 N N	/ 100 kHz EE EC	z 2. 2.	402 897 GH	z 4	ĭ 5.334	dBm dBm		FUNCT	ON WIDTH		eep 9.87 m	
rt 2.30 es BW N N N	/ 100 kHz 170 sc 1 f 1 f	z 2. 2.	.402 897 GH .390 022 GH	z 4	¥ 5.334 56.774	dBm dBm		FUNCT	ONWIDTH		eep 9.87 m	
rt 2.30 es BW N N N	/ 100 kHz 100 scu 1 f 1 f	z 2. 2.	.402 897 GH .390 022 GH	z 4	¥ 5.334 56.774	dBm dBm		FUNCT	ON WIDTH		eep 9.87 m	2.40300 G is (1001 p
es BW N N	/ 100 kHz 100 scu 1 f 1 f	z 2. 2.	.402 897 GH .390 022 GH	z 4	¥ 5.334 56.774	dBm dBm		FUNCT	ON WIDTH		eep 9.87 m	
rt 2.30 es BW N N N	/ 100 kHz 100 scu 1 f 1 f	z 2. 2.	.402 897 GH .390 022 GH	z 4	¥ 5.334 56.774	dBm dBm		FUNCT			eep 9.87 m	

78 CH



П



Page 35 of 69 Report No.: STS1812116W02

Temperature:	25 ℃	Relative Humidity:	50%
	π/4-DQPSK(2Mbps)– 00/39/78 CH	Test Voltage:	DC 3.7V

RL	RF 5	50 Ω AC		SENSE:INT	AL	.IGN AUTO		10:23:4	3 AM Dec 25, 2
nter F	req 12.51	15000000 GI	Hz PNO: Fast IFGain:Low	Trig: Free #Atten: 30		Avg Type:	Log-Pwr		RACE 1 2 3 4 TYPE MWWW DET P P P P
dB/div	Ref Offse Ref 12.7							Mkr1 2.4 2.	01 5 G 745 dE
5	¹								
3									-17.26
3									
		3							
	<mark>2</mark>	<u> </u>					ويتقدون المتحدي	and a first final	
		Columbia State							
nt 30 M es BW	VIHz 100 kHz		#	VBW 300 KH:	z		Swe	Stop ep 2.39 s	25.00 G (40001 p
MODE T N 1 N 1 N 1	1 f 1 f	× 2.401 5 2.561 3 4.803 6 24.710 3	GHz -55.5 GHz -49.8	45 dBm 58 dBm 52 dBm 55 dBm 55 dBm	NCTION FUNC	TION WIDTH	FI	UNCTION VALUE	

00 CH

39 CH	

RL	RF 50 Ω	AC	SEM	VSE:INT	ALI	GN AUTO		10:30:3	2 AM Dec 25,
enter Fr	req 12.515(000000 GHz	PNO: Fast 😱 Gain:Low	Trig: Free Run #Atten: 30 dB		Avg Type:	Log-Pwr		TYPE MWWW DET P P P
dB/div	Ref Offset 0.9 Ref 13.06							Mkr1 2.4 3.	40 9 G 058 di
g	(1								
16	Ĭ								
14									-16.9
9									-16.94
9									
9									
9	2	3							
9	N.		and the state of the state	and the second s	61		a such and the first states	and the second	
9 2000 100									
9									
9									
									25.00 G
art 30 N	1Hz							Stop	20.00 0
	NHZ 100 kHz		#VBW	300 kHz			Swe	stop ep 2.39 s	
	100 kHz	×	Y	FUNCTION	FUNCT	ION WIDTH			
es BW	100 kHz	2.440 9 GHz	3.058 dE	FUNCTION	FUNCT	ION WIDTH		ep 2.39 s	
es BW	100 kHz 6 501		Y	FUNCTION 3m	FUNCTI	ON WIDTH		ep 2.39 s	
es BW 1000 118 N 1 N 1	100 kHz f f f	2.440 9 GHz 2.698 0 GHz	3.058 dE -55.440 dE	FUNCTION 3m 3m 3m	FUNCT	ION WIDTH		ep 2.39 s	
es BW N 1 N 1 N 1	100 kHz f f f	2.440 9 GHz 2.698 0 GHz 4.881 7 GHz	3.058 dE -55.440 dE -52.294 dE	FUNCTION 3m 3m 3m	FUNCT	ON WIDTH		ep 2.39 s	
es BW N 1 N 1 N 1	100 kHz f f f	2.440 9 GHz 2.698 0 GHz 4.881 7 GHz	3.058 dE -55.440 dE -52.294 dE	FUNCTION 3m 3m 3m	FUNCT	ION WIDTH		ep 2.39 s	
es BW N 1 N 1 N 1	100 kHz f f f	2.440 9 GHz 2.698 0 GHz 4.881 7 GHz	3.058 dE -55.440 dE -52.294 dE	FUNCTION 3m 3m 3m	FUNCT	ION WIDTH		ep 2.39 s	
es BW N 1 N 1 N 1	100 kHz f f f	2.440 9 GHz 2.698 0 GHz 4.881 7 GHz	3.058 dE -55.440 dE -52.294 dE	FUNCTION 3m 3m 3m		ION WIDTH		ep 2.39 s	
es BW N 1 N 1 N 1	100 kHz f f f	2.440 9 GHz 2.698 0 GHz 4.881 7 GHz	3.058 dE -55.440 dE -52.294 dE	FUNCTION 3m 3m 3m	FUNCTI	ION WIDTH		ep 2.39 s	
es BW N 1 N 1 N 1	100 kHz f f f	2.440 9 GHz 2.698 0 GHz 4.881 7 GHz	3.058 dE -55.440 dE -52.294 dE	FUNCTION 3m 3m 3m	FUNCT	STATUS		ep 2.39 s	

П

Shenzhen STS Test Services Co., Ltd.



78 CH

	50 Ω A	C I	S	ENSE:INT	AL	IGN AUTO		10:33:3:	1 AM Dec 25, 2
enter Freq '	12.515000			Trig: Free	D	Avg Type:	Log-Pwr		RACE 1 2 3 4
		F	NO: Fast 😱 Gain:Low	#Atten: 30					DETPPP
Dof	Offset 0.5 dE							Mkr1 2.4	80 2 GI
dB/div Ref	f 12.58 dBr							2.	583 dB
.58	0 1								
42									
-									-17.42
7.4									
7.4									
7.4									
7.4	b^2	∂ ³				ير الاست	يد لدمن م		and a substitute
7.4	N.								
7.4		-							
7.4									
tart 30 MHz	kH7		#VBV	V 300 kHz			Sw	Stop eep 2.39 si	25.00 Gi (40001 p
Res BW 100								•	()
		X	Y	FUN	CTION FUNCT	ION WIDTH	-	UNCTION VALUE	
(R MODE TRC SCL 1 N 1 f		× 2.480 2 GHz	¥ 2.583 (dBm	CTION FUNCT	ION WIDTH	F	UNCTION VALUE	
R MODE TRC SCL 1 N 1 f 2 N 1 f		2.645 0 GHz	-55.807 c	dBm dBm	CTION FUNCT	ION WIDTH	F	UNCTION VALUE	
R MODE TRC SCL N 1 f 2 N 1 f 3 N 1 f		2.645 0 GHz 4.960 3 GHz	-55.807 c -54.870 c	IBm IBm IBm	CTION FUNCT	ION WIDTH	F	UNCTION VALUE	
R MODE TRC SCL N 1 f 2 N 1 f 3 N 1 f 4 N 1 f 5		2.645 0 GHz	-55.807 c	IBm IBm IBm	CTION FUNCT	ION WIDTH	F	UNCTION VALUE	
MODE TRC SCL 1 N 1 f 2 N 1 f 3 N 1 f 4 N 1 f 5 5 5 5		2.645 0 GHz 4.960 3 GHz	-55.807 c -54.870 c	IBm IBm IBm	CTION FUNC	ION WIDTH	F	UNCTION VALUE	
MODE TRC SCL 1 N 1 f 2 N 1 f 3 N 1 f 4 N 1 f 5 5 5 5 7 1 1 1		2.645 0 GHz 4.960 3 GHz	-55.807 c -54.870 c	IBm IBm IBm	CTION FUNCT	ION WIDTH	F	UNCTION VALUE	
2 N 1 f 3 N 1 f 4 N 1 f 6 7 7 8 9		2.645 0 GHz 4.960 3 GHz	-55.807 c -54.870 c	IBm IBm IBm	CTION FUNCT	ION WIDTH	F	UNCTION VALUE	
KR MODE TRC SOL 1 N 1 f 2 N 1 f 3 N 1 f 4 N 1 f 5 5 5 5 7 3 8 9 9 0 0 1		2.645 0 GHz 4.960 3 GHz	-55.807 c -54.870 c	IBm IBm IBm	CTION FUNCT	ION WIDTH	F	UNCTION VALUE	
R MODE TRC SCL 1 N 1 f 2 N 1 f 3 N 1 f 5 5 5 5 6 7 3 9 9 9 0 1 1 1		2.645 0 GHz 4.960 3 GHz	-55.807 c -54.870 c	IBm IBm IBm	CTION FUNCT		F	UNCTION VALUE	
KR MODE TRC SOL 1 N 1 f 2 N 1 f 3 N 1 f 4 N 1 f 5 5 5 5 7 3 8 9 9 0 0 1		2.645 0 GHz 4.960 3 GHz	-55.807 c -54.870 c	IBm IBm IBm	CTION FUNCT	STATUS	F	UNCTION VALUE	



П

Shenzhen STS Test Services Co., Ltd.

 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

 Tel: + 86-755 3688 6288
 Fax:+ 86-755 3688 6277
 Http://www.stsapp.com
 E-mail: sts@stsapp.com

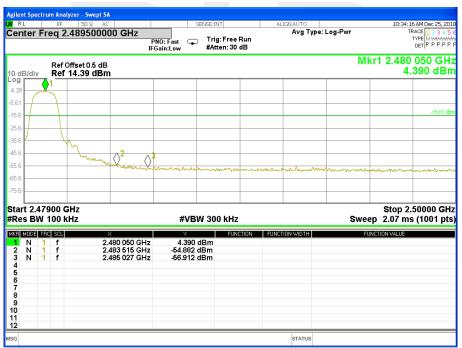


For Band edge

00 CH

	<mark>nalyzer - Swept S</mark> / RF 50 Ω AC			SENSE:INT	AI	IGN AUTO		10:24:2	7 AM Dec 25, 2
	2.3515000	00 GHz	'NO: Fast Gain:Low	Trin For a	Run	Avg Type:	Log-Pwr	TF	TYPE MWWW DET P P P P
	ef Offset 0.5 dB ef_14.49 dBn						M	kr1 2.402 4.	073 GI 490 dB
19									
51									-15.51
.5									
.6									
.5								∧2	لكر ا
.5 .5	manne	watana	ala and a state of the state of	nu water for the second	angalen Allen	Announder	han a han an a	manuelles	www.w
.5									
art 2.30000 es BW 100			#VB	W 300 kHz			Swe	Stop 2. ep 9.87 ms	40300 G (1001 p
R MODE TRC SO		× 402 073 GHz	Y 4.490	FUNC	TION FUNC	TION WIDTH	F	UNCTION VALUE	
	2.	402 073 GH2 390 022 GHz 399 910 GHz	4.490 -59.891 -46.952	dBm					
Image: state									
2									

78 CH





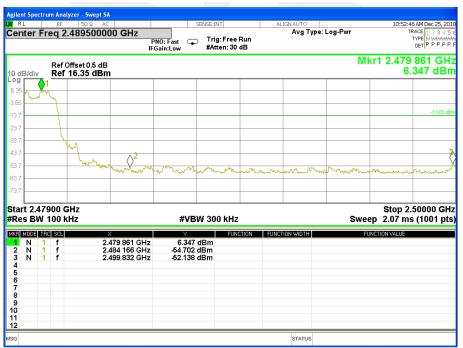


For Hopping Band edge

00 CH

	10:50:2		ALIGN AUTO	NT	SENSE: IN	DQ AC	RF 50 Ω	
RACE 1 2 3 4 TYPE MWWW DET P P P F		be: Log-Pwr		g:FreeRun ten:30 dB	IO: Fast Trig	500000 GHz		
,	Mkr1 2.401 6	N		ten. 30 dB	ain:Low #Au	0.5 dB	Ref Offset 0.5 Ref 16.44 d	
								7019
-13.56								
(_							
X	www.u.wuh	an address .	e					
Mr. M.	WWWWWWWWWW	hallen en erbetedel	mar WAUV VV VV	- setter - standy	and a start a s	and		w
							00 GHz	2.300
.40300 G	Stop 2							BW 1
.40300 G s (1001 p	Stop 2 weep 9.87 m	Sw		0 kHz	#VBW 30			
			FUNCTION WIDTH	0 kHz Function	Y	X	SCL	IODE TRC
	weep 9.87 m		FUNCTION WIDTH		6.438 dBm -56.259 dBm	2.401 867 GHz 2.390 022 GHz	SCL f f	N 1 N 1
	weep 9.87 m		FUNCTION WIDTH		Y 6.438 dBm	2.401 867 GHz	SCL f	N 1
	weep 9.87 m		FUNCTION WIDTH		6.438 dBm -56.259 dBm	2.401 867 GHz 2.390 022 GHz	SCL f f	N 1 N 1
	weep 9.87 m		FUNCTION WIDTH		6.438 dBm -56.259 dBm	2.401 867 GHz 2.390 022 GHz	SCL f f	N 1 N 1
	weep 9.87 m		FUNCTION WIDTH		6.438 dBm -56.259 dBm	2.401 867 GHz 2.390 022 GHz	SCL f f	N 1 N 1
	weep 9.87 m		FUNCTION WIDTH		6.438 dBm -56.259 dBm	2.401 867 GHz 2.390 022 GHz	SCL f f	N 1 N 1
	weep 9.87 m		FUNCTION WIDTH		6.438 dBm -56.259 dBm	2.401 867 GHz 2.390 022 GHz	SCL f f	N 1 N 1

78 CH



П



Page 39 of 69 Report No.: STS1812116W02

Temperature:	25 ℃	Relative Humidity:	50%
Test Mode:	8DPSK(3Mbps) -00/39/78 CH	Test Voltage:	DC 3.7V

		ectru	m Ana	alyzer - Swept S	A							
LXI R			RF				SENSE:INT	AL	IGN AUTO			9 AM Dec 25, 2018
Cer	nter	Fre	eq ′	12.515000	ŀ	PNO: Fast 🕞 Gain:Low	⊃ Trig: Free #Atten: 30		Avg Type:	Log-Pwr		RACE 1 2 3 4 5 6 TYPE M WWWWW DET P P P P P
10 d Log	B/div			Offset 0.5 dB 14.66 dBn		1				1		02 2 GHz 663 dBm
4.68			(
-5.34												45.24 /0-
-15.3												-15.34 dBm
-25.3 -35.3												
-35.3				. /	3							(*
-55.3	I .			\land	1	- H	A Statistic to a solution of the solution	and the second			and the second	Index all the second
-65.3												
-75.3												
Sta #Re	rt 30 es Bi			kHz		#VB	W 300 kHz			Swe		25.00 GHz (40001 pts)
1	MODE N N	1 1	f f		× 2.402 2 GHz 3.301 7 GHz	4.663 -55.703	dBm	CTION FUNCT	TION WIDTH	F	JNCTION VALUE	
2 3 4 5 6 7 8 9 10	N N	1	f f		4.804 3 GHz 24.576 8 GHz	-50.950 -48.116	dBm					
6 7 8												
9 10 11 12												
MSG									STATUS			

00 CH

CH	
OIT	
	СН

	RF		AC		SENSE:INT	AL	IGN AUTO		11:04:1	2 AM Dec 25
er F	req 1	2.51500		NO: Fast Gain:Low	Trig: Free #Atten: 30		Avg Type:	Log-Pwr		TYPE MWM DET P P P
3/div		Offset 0.5 d 12.90 dB							Mkr1 2.4 3.	40 9 G 305 d
)1								
<u> </u>										-17.1
										-17.
		2	- ∂ ³							المقادر والم
t 30 M	1H7								Ston	25.00
s BW		Hz		#VB	W 300 kHz	!		Swe	ep 2.39 s	
MODE TI			× 2.440 9 GHz	¥ 3.305		ICTION FUNCT	TION WIDTH	FL	JNCTION VALUE	
N 1 N 1 N 1	f		3.162 5 GHz 4.882 3 GHz 24.716 6 GHz	-53.541 -52.409 -48.147	dBm dBm					

Ħ



78 CH

Ref Offset 0.5 dB 4J/div Ref 14.29 dBm 29 71 1 1 1 1 1 1 1 1 1 1 1 1 1	RL RF	lyzer - Swept S 50 Ω A0		9	ENSE:INT		ALIGNAUTO			42 AM Dec 25, 2
Bildiv Ref 0.1580.3 dB 4.288 d 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2.333 5 (Hz 2 3 1	nter Freq 1	2.515000	PI	NO: Fast 🖵 Gain:Low			Avg Type:	Log-Pwr		TYPE M WWW DET P P P P
9 7 7 7 7 7 7 7 7 7 7 7 7 7	dB/div Ref									80 2 G .288 dB
7		1								
Image: Stop 25.00 Stop 25.00 Stop 20.00 Stop 20.00	1									
V2 V3 V3<										-15.71
V2 V3 V3 V3 rt 30 MHz Stop 25.00 Stop 25.00 25 BW 100 kHz #VBW 300 kHz Stop 25.00 25 BW 100 kHz #VBW 300 kHz Sweep 2.39 s (40001 M009 HzC So. X ¥ VBW 300 kHz FUNCTION WALLE N 1 f 3.024 5 GHz -55.416 dBm N 1 f 3.932 5 GHz -55.416 dBm N 1 f 3.923 1 dBm FUNCTION WALLE										
rt 30 MHz ss BW 100 kHz T 30 MHz ss BW 100 kHz T 30 2.39 s (40001 T 30 2.480 2 GHz T 30										
xt xt<		$\sum_{i=1}^{2}$		and a second second		and the second		a standard and a		
xt 30 MHz Stop 25.00 es BW 100 kHz #VBW 300 kHz Sweep 2.39 s (40001 Model FRG Sc. X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE Model FRG Sc. X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE N 1 f 3.024 5 GHz -55.416 dBm 55.335 6 GHz -55.21 dBm N 1 f 5.9335 6 GHz -55.21 dBm - -	and the second se						1			-
W100 kHz #VEW 300 kHz Sweep 2.39 s (40001 M00et Inclison X Y Function Function whith Function whith N 1 f 2.480 2 GHz 4.288 dBm Function Function whith Function whith N 1 f 3.024 5 GHz -55.416 dBm 55.335 GHz -55.212 dBm	7									
N 1 f 2.480 2 GHz 4.288 dBm N 1 f 3.024 5 GHz -55.415 dBm N 1 f 5.933 5 GHz -55.21 dBm		٢Hz		#VBI	W 300 kHz	1		Swe		
N 1 f 3.024 5 GHz -55.415 dBm N 1 f 5.933 5 GHz -55.021 dBm				Ŷ		CTION FUN	CTION WIDTH	F	UNCTION VALUE	
	N 1 f		3.024 5 GHz	-55.415	dBm					
STATUS										



Shenzhen STS Test Services Co., Ltd.

 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

 Tel: + 86-755 3688 6288
 Fax:+ 86-755 3688 6277
 Http://www.stsapp.com
 E-mail: sts@stsapp.com

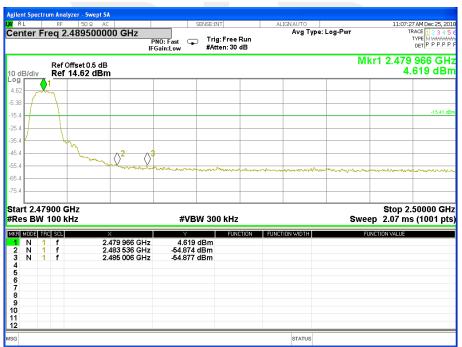


For Band edge

00 CH

	rum Analyzer										
enter F	_R , req 2.35	50 Ω AC 150000		PNO: Fast IFGain:Low	SENSE:INT	Free Run n: 30 dB	ALIG	NAUTO Avg Type:	Log-Pwr		53 AM Dec 25, 2 IRACE 1 2 3 4 TYPE M WANNA DET P P P P
) dB/div	Ref Offse Ref 14.								Ν	1kr1 2.401 4	970 GH .617 dB
62											
38											-15.38
.4											
.4											
4			and the same of	molenance	dim mar	a la araba	manuel	www.hww.nku	Venalesantes		and and a start of the
i.4											
	0000 GHz 100 kHz			#1	/BW 300	kHz			Sw	Stop 2 eep 9.87 m	.40300 G s (1001 p
R MODE T	RC SCL	2.4	01 970 GH	z 4.6	17 dBm	FUNCTION	FUNCTIO	N WIDTH		FUNCTION VALUE	
2 N 1 3 N 1 5 5 7 3			90 022 GH; 99 910 GH;		91 dBm 88 dBm						
)											
2											

78 CH





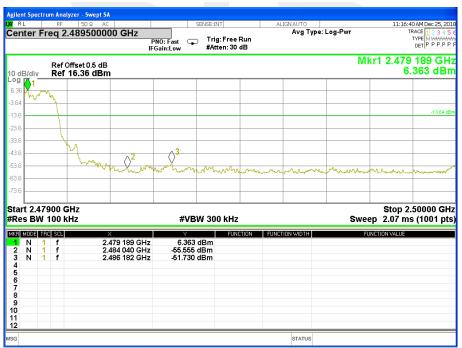


For Hopping Band edge

00 CH

	11:14:	ALIGN AUTO	Т	SENSE: IN	50 Ω AC	RF 5
RACE 1 2 3 TYPE M WAAA DET P P P	· T	Avg Type: Log-Pwr	: Free Run en: 30 dB			req 2.351
000 G 403 dI	Mkr1 2.403 6				fset 0.5 dB 6.40 dBm	
-13.6						
(
		mounter				
V-VINNAV"	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		- when have a second second	som have and	entern million and an and an and an and an	Other and the second se
						0000 GHz
40200 0	Stop 2					100 GHZ
40300 G s (1001 j	Stop 2 Sweep 9.87 m	Sv) kHz	#VBW 300	Z	100 KHZ
		Sv FUNCTION WIDTH) KHZ FUNCTION	Y	×	TRC SCL
	Sweep 9.87 m				-	
	Sweep 9.87 m			Y 6.403 dBm	× 2.403 000 GHz	RC SCL
	Sweep 9.87 m			6.403 dBm -55.041 dBm	× 2.403 000 GHz 2.390 022 GHz	TRC SCL 1 f 1 f
	Sweep 9.87 m			6.403 dBm -55.041 dBm	× 2.403 000 GHz 2.390 022 GHz	TRC SCL 1 f 1 f
	Sweep 9.87 m			6.403 dBm -55.041 dBm	× 2.403 000 GHz 2.390 022 GHz	TRC SCL 1 f 1 f
	Sweep 9.87 m			6.403 dBm -55.041 dBm	× 2.403 000 GHz 2.390 022 GHz	TRC SCL 1 f 1 f
	Sweep 9.87 m			6.403 dBm -55.041 dBm	× 2.403 000 GHz 2.390 022 GHz	TRC SCL 1 f 1 f

78 CH



П



5. NUMBER OF HOPPING CHANNEL

5.1 LIMIT

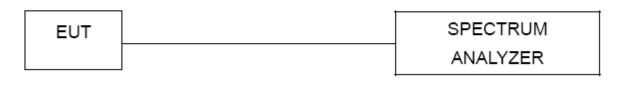
	FCC Part 15.247,Subpart C									
Section	Test Item	Limit	FrequencyRange (MHz)	Result						
15.247 (a)(1)(iii)	Number of Hopping Channel	≥15	2400-2483.5	PASS						

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating FrequencyRange
RB	1MHz
VB	1MHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

5.2 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- b. Spectrum Setting : RBW= 1MHz, VBW=1MHz, Sweep time = Auto.

5.3 TEST SETUP



5.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



5.5 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	60%
Test Mode:	Hopping Mode -GFSK Mode	Test Voltage:	DC 3.7V

Number of Hopping Channel

79

Hopping channel

	RF 50 Ω	AC	SENSE:INT		ALIGN AUTO		10:06:36 AM De	
enter Fr	eq 2.44175	50000 GHz PNO IFGai	: Fast 😱 Trig: Fre n:Low #Atten: 3	ee Run 30 dB	Avg Type:	Log-Pwr	TRACE 1 TYPE M DET P	LARAJUA
0 dB/div	Ref Offset 0.6 Ref 15.50 (Mkr2	2.480 160 0 5.55	
og								
.50								
4.5								
1.5								
1.5								
4.5								
4.5								
tart 2.400 Res BW 1	1.0 MHz		#VBW 1.0 MH				Stop 2.4835 p 1.00 ms (100	i0 G 01 p
KR MODE TRO 1 N 1 2 N 1 3	f f	× 2.401 837 0 GHz 2.480 160 0 GHz	5.50 dBm 5.55 dBm	UNCTION	UNCTION WIDTH	FUN	ICTION VALUE	
4 5 6 7								
8								
9								

Shenzhen STS Test Services Co., Ltd.



6. AVERAGE TIME OF OCCUPANCY

6.1 LIMIT

FCC Part 15.247,Subpart C					
Section	Test Item	Limit	FrequencyRange (MHz)	Result	
15.247 (a)(1)(iii)	Average Time of Occupancy	0.4sec	2400-2483.5	PASS	

6.2 TEST PROCEDURE

- a. The transmitter output (antenna port) was connected to the spectrum analyzer
- b. Set RBW =1MHz/VBW =3MHz.
- c. Use a video trigger with the trigger level set to enable triggering only on full pulses.
- d. Sweep Time is more than once pulse time.
- Set the center frequency on any frequency would be measure and set the frequency span to e. zero span.
- f. Measure the maximum time duration of one single pulse.
- g. Set the EUT for DH5, DH3 and DH1 packet transmitting.
- h. Measure the maximum time duration of one single pulse.
- i. DH5 Packet permit maximum 1600/ 79 / 6 = 3.37 hops per second in each channel (5 time slots RX, 1 time slot TX). Sothe dwell time is the time duration of the pulse times 3.37 x 31.6 = 106.6 within 31.6 seconds.
- j. DH3 Packet permit maximum 1600 / 79 / 4 = 5.06 hops per second in each channel (3 time slots RX, 1 time slot TX). So he dwell time is the time duration of the pulse times $5.06 \times 31.6 = 160$ within 31.6 seconds.
- k. DH1 Packet permit maximum 1600 / 79 /2 = 10.12 hops per second in each channel (1 time slot RX, 1 time slot TX). So the dwell time is the time duration of the pulse times $10.12 \times 31.6 = 320$ within 31.6 seconds.

6.3 TEST SETUP



6.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



6.5 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	50%
Test Mode:	GFSK(1Mbps)-DH1/DH3/DH5	Test Voltage:	DC 3.7V

Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
DH1	middle	0.384	0.123	0.4
DH3	middle	1.646	0.263	0.4
DH5	middle	2.892	0.308	0.4



Shenzhen STS Test Services Co., Ltd.

1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China Tel: + 86-755 3688 6288 Fax:+ 86-755 3688 6277 Http://www.stsapp.com E-mail: sts@stsapp.com



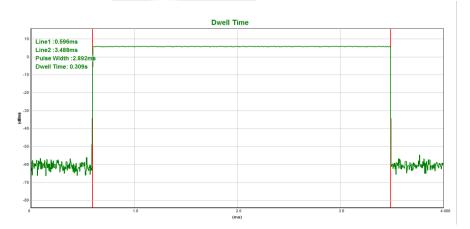
CH39-DH1

	Dwell Time					
0- -10-	Line1 :0.429ms Line2 :0.814ms Pulse Width :0.394ms Dwell Time: 0.123s	-Mardolli Minilderina Adalaticani				
-20 -						
-50			Malika ana ana ana ana ana ana ana ana ana a	hill an when the		
-70 -80 -90			r p r	111. 1		
0		(ms)	1	1.0 1.1		

CH39-DH3









Page 48 of 69 Report No.: STS1812116W02

Temperature:	25 ℃	Relative Humidity:	50%
Test Mode:	π/4-DQPSK(2Mbps)– 2DH1/2DH3/2DH5	Test Voltage:	DC 3.7V

Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
2DH1	middle	0.393	0.126	0.4
2DH3	middle	1.646	0.263	0.4
2DH5	middle	2.901	0.309	0.4



П

Shenzhen STS Test Services Co., Ltd.

 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

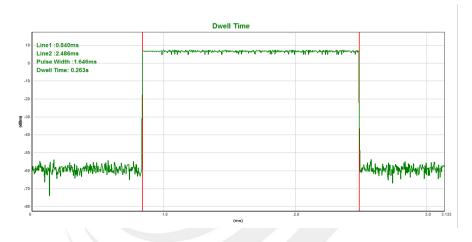
 Tel: + 86-755 3688 6288
 Fax:+ 86-755 3688 6277
 Http://www.stsapp.com
 E-mail: sts@stsapp.com



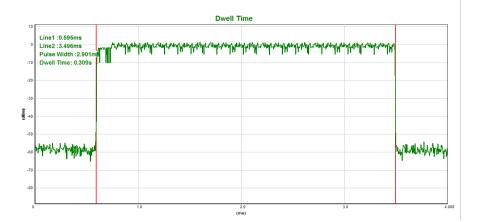
CH39-2DH1



CH39-2DH3



CH39-2DH5





Page 50 of 69 Report No.: STS1812116W02

Temperature:	25 ℃	Relative Humidity:	50%
	8DPSK(3Mbps)– 3DH1/3DH3/3DH5	Test Voltage:	DC 3.7V

Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
3DH1	middle	0.394	0.126	0.4
3DH3	middle	1.645	0.263	0.4
3DH5	middle	2.902	0.310	0.4



П

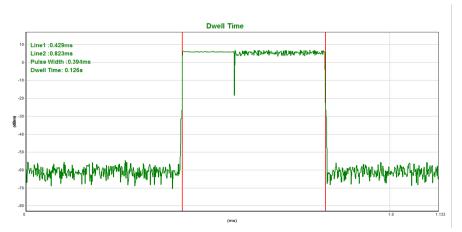
Shenzhen STS Test Services Co., Ltd.

 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

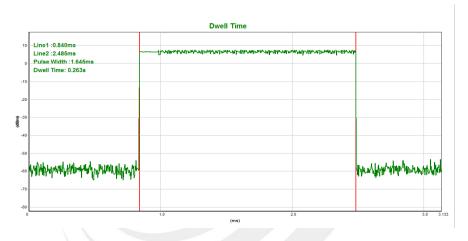
 Tel: + 86-755 3688 6288
 Fax:+ 86-755 3688 6277
 Http://www.stsapp.com
 E-mail: sts@stsapp.com



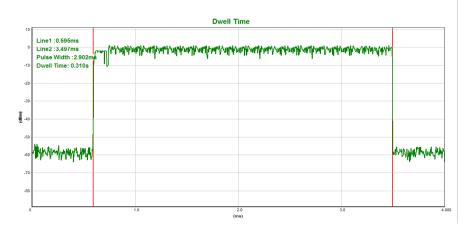
CH39-3DH1



CH39-3DH3



CH39-3DH5



Shenzhen STS Test Services Co., Ltd.

 1/F., Building B, Zhuoke Science Park, No. 190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

 Tel: + 86-755 3688 6288
 Fax:+ 86-755 3688 6277
 Http://www.stsapp.com
 E-mail: sts@stsapp.com



7. HOPPING CHANNEL SEPARATION MEASUREMEN

7.1 LIMIT

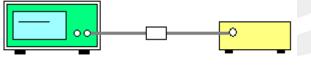
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Spectrum Parameter	Setting		
Attenuation	Auto		
Span Frequency	> 20 dB Bandwidth or Channel Separation		
RB	30 kHz (20dB Bandwidth) / 30 kHz (Channel Separation)		
VB	100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)		
Detector	Peak		
Trace	Max Hold		
Sweep Time	Auto		

7.2 TEST PROCEDURE

- a. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
- b. The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for 20 dB bandwidth measurement.
- c. The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for channel separation measurement.

7.3 TEST SETUP



Spectrum Analayzer

EUT

7.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.



7.5 TEST RESULTS

Temperature:	25°C	Relative Humidity:	50%
	CH00 / CH39 / CH78 (GFSK(1Mbps) Mode)	Test Voltage:	DC 3.7V

Frequency	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	0.960	0.683	Complies
2441 MHz	0.999	0.683	Complies
2480 MHz	0.960	0.683	Complies

For GFSK: Ch. Separation Limits: >two-thirds 20dB bandwidth

L I	RF 50	wept SA Ω AC	SENSE:INT		ALIGN AUTO		9:04:28 AM Dec 25, 3
		500000 GHz			Avg Type: Log		TRACE 1 2 3 4
	•			Free Run en: 30 dB			DET P P P
IB/div	Ref Offset 0 Ref 12.58					Mkr2 2.	402 989 G 3.477 dE
			$\langle 1 \rangle$		2		
					\sim	~~~	
			2	\sim		- M	
	~					~	\sim
~	~						
~~~~	w.						
<u> </u>							
	102500 GH2 30 kHz	Z	#VBW 100	kHz		Sweep 3.2	pan 3.000 M 0 ms (1001 p
MODE TR		×	Y	FUNCTION FL	INCTION WIDTH	FUNCTION V4	LUE
N 1		2.402 029 GHz 2.402 989 GHz	2.58 dBm 3.48 dBm				
		2.102 000 0112	0.40 42.00				

### CH00 -1Mbps

Shenzhen STS Test Services Co., Ltd.



#### CH39 -1Mbps



#### CH78 -1Mbps



Shenzhen STS Test Services Co., Ltd.

 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

 Tel: + 86-755
 3688
 6277
 Http://www.stsapp.com
 E-mail: sts@stsapp.com



Page 55 of 69 Report No.: STS1812116W02

Temperature:	25℃	Relative Humidity:	50%
	CH00 / CH39 / CH78 (π/4-DQPSK(2Mbps) Mode)	Test Voltage:	DC 3.7V

Frequency	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	0.996	0.859	Complies
2441 MHz	0.999	0.859	Complies
2480 MHz	0.999	0.859	Complies

For  $\pi$ /4-DQPSK(2Mbps): Ch. Separation Limits: > two-thirds 20dB bandwidth

		PNO: Wide IFGain:Low	#Atten: 30	dB		Male	
dB/div Ref 9	set 0.5 dB .49 dBm					IVIKI	2 2.402 995 -0.57
g 51		⟨⟩1			2		
5		$\sim$	have	$\sim$	$\sim$	m	$\sim$
5	~						<u> </u>
5							\
5 mm							\/
5							
5							
5							
5							
	GHz	#V	/BW 100 kHz	<u>!</u>		Swee	Span 3.000 3.20 ms (100
			EID	ICTION FUNCTION	IN WIDTH	FUN	CTION VALUE
es BW 30 kHz Mode TRC SCL	×	Y					
nter 2.402500 es BW 30 kHz MODE THE SCL N 1 f	2.401 999	GHz -0.	51 dBm				
es BW 30 kHz Mode TRC SCL		GHz -0.					
es BW 30 kHz Mode TRO Sol	2.401 999	GHz -0.	51 dBm				
es BW 30 kHz NODE TRO SOL	2.401 999	GHz -0.	51 dBm				
es BW 30 kHz N 1 f N 1 f	2.401 999	GHz -0.	51 dBm				
es BW 30 kHz N 1 f N 1 f	2.401 999	GHz -0.	51 dBm				

#### CH00 -2Mbps



## CH39 -2Mbps

RF 50 Ω AC	SENSE:INT	ALIGN AUTO	10:31:46 AM Dec 25,
er Freq 2.441500000 GH	Z PNO: Wide Trig: Fre IFGain:Low #Atten: 3	Avg Type: Log-Pwr e Run 0 dB	TRACE 1 2 3 TYPE M WW DET P P
Ref Offset 0.5 dB /div Ref 9.13 dBm			Mkr2 2.442 355 G -0.86 dl
	()1		2
	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		m
ter 2.441500 GHz			Span 3.000 M
s BW 30 kHz	#VBW 100 kH	lz S	weep 3.20 ms (1001
MODE TRC SCL X		INCTION FUNCTION WIDTH	FUNCTION VALUE
N 1 f 2.441 356 N 1 f 2.442 355			
1.42.000			

CH78 -2Mbps

Agilent Spectrum Analyzer - Swept SA					
LX/RL RF 50Ω AC	SENSE:	INT	ALIGN AUTO		35:17 AM Dec 25, 2018
Center Freq 2.479500000 GHz	PNO: Wide 🖵 Tri IFGain:Low #A	ig: Free Run tten: 30 dB	Avg Type: L	.og-Pwr	TRACE 1 2 3 4 5 0 TYPE M WANNAM DET P P P P P
Ref Offset 0.5 dB 10 dB/div Ref 9.44 dBm				Mkr2 2.4	80 355 GHz -0.59 dBm
Log -0.56		<u></u>		2	
-10.6		m	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	mund	
-20.6					
-30.6					
-40.6					
-50.6					
-60.6					
-70.6					
-80.6					
Center 2.479500 GHz #Res BW 30 kHz	#VBW 10	0 kHz		Sp Sweep 3.20	an 3.000 MH ms (1001 pts
MKR MODE TRC SCL X	Y	FUNCTION FU	NCTION WIDTH	FUNCTION VALU	E
1 N 1 f 2.479 356 0 2 N 1 f 2.480 355 0					
3 4					
5					
4 5 6 7 8 9					
9					
10 11					
12					
MSG			STATUS		





Temperature:	25℃	Relative Humidity:	50%
	CH00 / CH39 / CH78 (8DPSK(3Mbps)Mode)	Test Voltage:	DC 3.7V

Frequency	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	1.035	0.901	Complies
2441 MHz	1.032	0.901	Complies
2480 MHz	1.002	0.901	Complies

For 8DPSK(3Mbps):Ch. Separation Limits: > two-thirds 20dB bandwidth

gilent Spectrum A	nalyzer - Swept SA F 50 Ω AC	SENSE: IN	T	ALIGN AUTO		11:01:40 AM Dec 25,
	2.402500000 GHz	NO: Wide Trig:	: Free Run en: 30 dB	Avg Type:	Log-Pwr	TRACE 1234 TYPE MWWW DET P P P F
dB/div Re	f Offset 0.5 dB if 10.12 dBm				Mkr	2 2.402 959 G 0.175 dE
og 120		⊘ 1		2		
.88		m	\sim	\sim	m	\sim
9.9						
9.9						
99	/					1 m
9.9						
9.9						
9.9						
9.9						
5.5						
enter 2.402: Res BW 30 I		#VBW 100	kHz		Sweep	Span 3.000 M 3.20 ms (1001 p
KR MODE TRC SC		Y	FUNCTION	FUNCTION WIDTH	FUNC	TION VALUE
1 N 1 f 2 N 1 f	2.401 924 GHz 2.402 959 GHz	0.12 dBm 0.18 dBm				
3						
4 5						
5 7						
3						
9						
1						
G				STATUS		

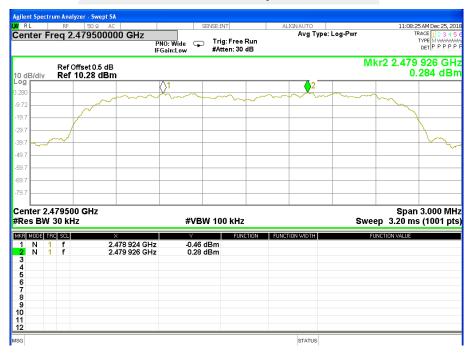
CH00 -3Mbps



CH39 -3Mbps

	RF 50 Ω	AC		SENSE:INT		ALIGN AUTO		11:04:55 AM Dec
ter Fred	2.44150	10000 GHz	PNO: Wide IFGain:Low	Trig: Fr #Atten:	ee Run 30 dB	Avg Type: I	Log-Pwr	TRACE 1 2 TYPE MY DET P F
	ef Offset 0.5 ef 9.77 dE						Mk	r2 2.441 956 -0.135
			()1			2		
		\sim	~~~~	m	~~~~	m	m	\sim
	\neg							~
								\
	1							\
\sim	/							
· ~~								
<u> </u>								
ter 2 441	500 GHz							Span 3.000
s BW 30			\$	¢VBW 100 k	Hz		Swee	p 3.20 ms (100
MODE TRC S		×			UNCTION	FUNCTION WIDTH	FUN	ICTION VALUE
	f f	2.440 924		0.23 dBm 0.14 dBm				
	•	2.441 300	5112 -	0.14 0.011				

CH78 -3Mbps



 1/F., Building B, Zhuoke Science Park, No. 190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

 Tel: + 86-755
 3688
 6287
 Http://www.stsapp.com
 E-mail: sts@stsapp.com



8. BANDWIDTH TEST

8.1 LIMIT

FCC Part15 15.247,Subpart C							
Section	Test Item	Limit	FrequencyRange (MHz)	Result			
15.247 (a)(1)	Bandwidth	(20dB bandwidth)	2400-2483.5	PASS			

Spectrum Parameter	Setting			
Attenuation	Auto			
Span Frequency	> Measurement Bandwidth or Channel Separation			
RB	30 kHz (20dB Bandwidth) / 30 kHz (Channel Separation)			
VB	100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)			
Detector	Peak			
Trace	Max Hold			
Sweep Time	Auto			

8.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

b. Spectrum Setting : RBW= 30KHz, VBW=100KHz, Sweep time = Auto.

8.3 TEST SETUP

EUT	SPECTRUM
	ANALYZER

8.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

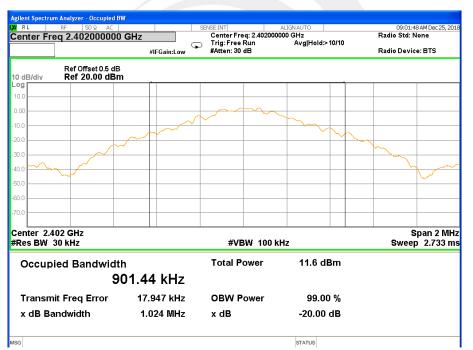


8.5 TEST RESULTS

Temperature:	25°C	Relative Humidity:	50%
	GFSK(1Mbps) CH00 / CH39 / C78	Test Voltage:	DC 3.7V

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.024	PASS
2441 MHz	1.025	PASS
2480 MHz	1.024	PASS

CH00 -1Mbps



Shenzhen STS Test Services Co., Ltd.

1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China Tel: + 86-755 3688 6288 Fax: + 86-755 3688 6277 Http://www.stsapp.com E-mail: sts@stsapp.com



CH39 -1Mbps



CH78 -1Mbps





Page 62 of 69 Report No.: STS1812116W02

Temperature:	25℃	Relative Humidity:	50%
	π/4-DQPSK(2Mbps) CH00 / CH39 / C78	Test Voltage:	DC 3.7V

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.288	PASS
2441 MHz	1.289	PASS
2480 MHz	1.289	PASS

CH00 -2Mbps

Agilent Spectrum Analyzer - Occupied B	W			
X RL RF 50 Ω AC Center Freq 2.402000000	GH ₇	INT REF Center Freg: 2.4020000	ALIGN AUTO	01:20:24 PMDec 26, 2018 Radio Std: None
	#IFGain:Low	Trig: Free Run #Atten: 30 dB	Avg Hold≫10/10	Radio Device: BTS
10 dB/div Ref 20.00 dBn	n			
Log				
0.00				
-10.0		m		
-20.0				
-30.0				
-40.0				
-50.0				
-60.0				
-70.0				
Center 2.402 GHz				On on O Mills
#Res BW 30 kHz		#VBW 100 k	Hz	Span 2 MHz Sweep 2.733 ms
Occupied Bandwidt	h	Total Power	10.1 dBm	
1.	1789 MHz			
Transmit Freq Error	2.011 kHz	OBW Power	99.00 %	
x dB Bandwidth	1.288 MHz	x dB	-20.00 dB	
MSG			STATUS	

Shenzhen STS Test Services Co., Ltd.

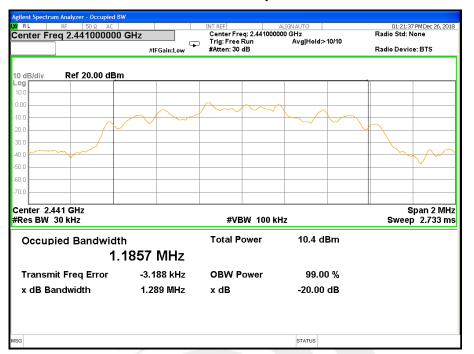
Ħ

 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

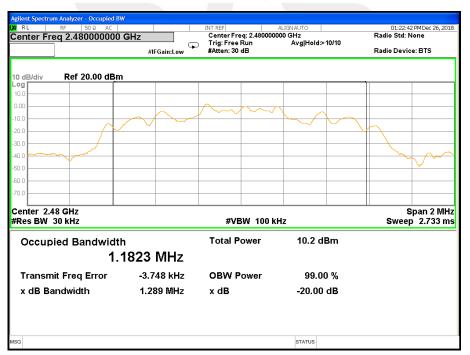
 Tel: + 86-755 3688 6288
 Fax:+ 86-755 3688 6277
 Http://www.stsapp.com
 E-mail: sts@stsapp.com



CH39 -2Mbps



CH78 -2Mbps



Shenzhen STS Test Services Co., Ltd.

 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

 Tel: + 86-755
 3688
 6287
 Http://www.stsapp.com
 E-mail: sts@stsapp.com



Page 64 of 69 Report No.: STS1812116W02

Temperature:	25°C	Relative Humidity:	50%
	8DPSK(3Mbps) CH00 / CH39 / CH78	Test Voltage:	DC 3.7V

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.351	PASS
2441 MHz	1.351	PASS
2480 MHz	1.352	PASS

CH00 -3Mbps



П

Shenzhen STS Test Services Co., Ltd.

 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

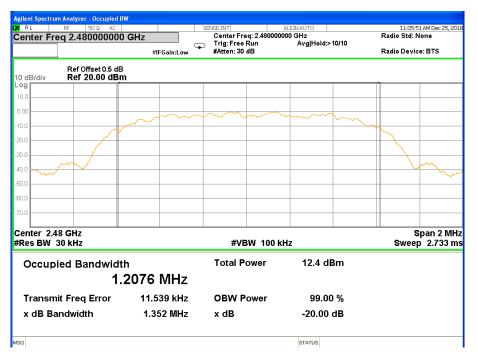
 Tel: + 86-755
 3688
 6287
 Http://www.stsapp.com
 E-mail: sts@stsapp.com



CH39 -3Mbps



CH78 -3Mbps



Shenzhen STS Test Services Co., Ltd.

 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

 Tel: + 86-755
 3688
 6277
 Http://www.stsapp.com
 E-mail: sts@stsapp.com



9. OUTPUT POWER TEST

9.1 LIMIT

FCC Part 15.247,Subpart C				
Section	Test Item	Limit	FrequencyRange (MHz)	Result
15.247	Outout	1 W or 0.125W		
(a)(1)&(b)(1)	Output Power	if channel separation > 2/3 bandwidthprovided thesystems operatewith an output power no greater than125 mW(20.97dBm)	2400-2483.5	PASS

9.2 TEST PROCEDURE

a. The EUT was directly connected to the Power Sensor&PC

9.3 TEST SETUP

EUT	Power sensor		PC
-----	--------------	--	----

9.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



9.5 TEST RESULTS

Temperature:	25°C	Relative Humidity:	60%
Test Voltage:	DC 3.7V		

Mode Channel Number		Frequency	Peak Power	Average Power	Limit
	(MHz)	(dBm)	(dBm)	(dBm)	
	0	2402	4.53	4.32	20.97
GFSK(1M)	39	2441	4.48	4.63	20.97
	78	2480	5.38	5.16	20.97

Note: the channel separation >2/3 20dB bandwidth

Mode	Channel Number	Frequency (MHz)	Peak Power	Average Power	Limit
			(dBm)	(dBm)	(dBm)
π/4-DQPSK (2M)	0	2402	7.66	5.13	20.97
	39	2441	8.01	5.44	20.97
	78	2480	6.88	4.29	20.97

Note: the channel separation >2/3 20dB bandwidth

Mode	Channel Number	Frequency (MHz)	Peak Power	Average Power	Limit
			(dBm)	(dBm)	(dBm)
8-DPSK(3M)	0	2402	8.28	5.14	20.97
	39	2441	8.51	5.40	20.97
	78	2480	8.17	4.97	20.97

Note: the channel separation >2/3 20dB bandwidth



10. ANTENNA REQUIREMENT

10.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

10.2 EUT ANTENNA

The EUT antenna is PIFA Antenna. It comply with the standard requirement.



Shenzhen STS Test Services Co., Ltd.

1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China Tel: + 86-755 3688 6288 Fax:+ 86-755 3688 6277 Http://www.stsapp.com E-mail: sts@stsapp.com



APPENDIX-PHOTOS OF TEST SETUP

Note: See test photos in setup photo document for the actual connections between Product and support equipment.



Shenzhen STS Test Services Co., Ltd.

 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

 Tel: + 86-755
 3688
 6287
 Http://www.stsapp.com
 E-mail: sts@stsapp.com